

Inter (Part-II) 2019

Biology	Group-II	PAPER: II
Time: 2.40 Hours	(SUBJECTIVE TYPE)	Marks: 68

SECTION-I

2. Write short answers to any EIGHT (8) questions: (16)

(i) Differentiate between ectotherms and endotherms.

Ans **Ectotherms**

Animals that generate metabolic heat at low level and that is also exchanged quickly with environment, however, absorb heat from surrounding are called ectotherms, e.g., most invertebrates, fish, amphibians, reptiles.

Endotherms

Animals that generate their own body heat during metabolism are endotherms e.g., birds, mammals, some fish and flying insects.

(ii) Why the leaves are said to be excretophore?

Ans The falling of yellow leaves in autumn is the seasonal time for plants to get rid of the accumulated wastes and because of this reason leaves are said to be excretophore.

(iii) Differentiate between protonephridia and metanephridia.

Ans **Protonephridia**

Planaria, the animals of the group of flatworms have simple tubular excretory system called protonephridium. A protonephridium is a network of closed tubules without internal opening in planaria.

Metanephridia

Earthworm is the ideal example of tubular excretory system as metanephridium. This system has internal ciliated opening nephrostome which is immersed in coelomic fluid and enveloped by a network of capillaries. Nephrostome collects coelomic fluid.

(iv) Write two characteristics of collenchyma tissue.

Ans Following are the two characteristics of collenchyma tissue:

1. They have angular thickening in their primary walls.
2. They are usually grouped in strands or cylinders.

(v) Define phototactic movements with example.

Ans It is a movement in response to stimulus of light. The movement may be towards the source of light (positive) or away from the source of light (negative). The best example of positive

tactic movement is the passive movement of chloroplast due to cyclosis. This movement helps the chloroplast to absorb maximum light for CO_2 fixation.

(vi) **How callus is formed?**

Ans Important function of the cambium is to form callus or wood tissue on or over the wound, soft parenchymatous tissues are rapidly formed on or below the damaged surface of stems and roots. Callus unites the branches during budding and grafting.

(vii) **What are palindromic sequences?**

Ans It is a nucleic acid sequence on DNA or RNA where in reading 5' (five prime) to 3' (three primary) forward on one strand matches sequence reading 5' to 3' on the complementary strand with which it forms a double helix e.g., 5' GAATTC 3'.

(viii) **Compare ex-vivo and in-vivo gene therapy.**

Ans **Ex-vivo**

In ex-vivo gene therapy, normal gene is given to certain cells of the patient, outside the body of the patient and then these cells are returned to the patient.

In-vivo

In in-vivo gene therapy, patients are directly given normal genes in one way or the other.

(ix) **Write two adaptations for terrestrial ecosystem.**

Ans Following are the two adaptations for terrestrial ecosystem:

1. Both plants and animals evolved various methods to conserve water in their body e.g., Homeostasis.
2. The mechanism of temperature regulation was developed by land plants and animals by developing bark and skin, respectively

(x) **Differentiate between alpine and boreal forests.**

Ans **Alpine forests**

Coniferous forests located at high altitude are called alpine.

Boreal forests

Coniferous forests located at high latitude are called boreal.

(xi) **What is the importance of ozone layer?**

Ans Ozone layer is a layer of atmosphere extending from 10 to 50 kilometers above earth, which filters most of ultraviolet radiations and protects us from these harmful rays of the sun.

(xii) Differentiate between deforestation and reforestation.

Ans Deforestation

Clearance of vast areas of forest for procuring lumber, planting subsistence crops or grazing cattle is called deforestation.

Reforestation

Reforestation is the replantation of trees. It is important for many conifer species which require bare soil to establish.

3. Write short answers to any EIGHT (8) questions: (16)

(i) Write down two uses of auxins.

Ans Following are the two uses of auxins:

1. Promote apical dominance and fruit growth. They can sometimes induce parthenocarpy.
2. In stem, promote cell enlargement in region behind apex. Promote cell division in cambium.

(ii) How communication across the synapse occurs?

Ans When an impulse reaches a synaptic knob, the synaptic vesicles fuse with the presynaptic membrane, causing the release of neurotransmitter molecules into the synaptic cleft. The neurotransmitter molecules bind to receptors on the post synaptic membrane triggering an action potential in the postsynaptic neuron, by causing changes in its permeability to certain ions.

(iii) Define habituation. Give one example.

Ans Habituation is the simplest form of learning and involves modification of behaviour through diminution of response to repeated stimuli. A loss of receptivity to repetitious stimuli can be useful in preventing a drain of energy and attention for trivial purposes. For example:

Rodents respond to alarm calls by others in their group, if these calls are continued and no danger is confirmed, further calls may be ignored.

(iv) Write down the mechanism of pollen tube evolution in spermatophytes.

Ans Evolution of pollen tube is an important step in land adaptation by the spermatophytes. Pollen tube acts as vehicle for male gametes for their safe transport to female gamete in ovule in hostile land environment. Evolution of pollen tube is parallel to the evolution of seed and is a tool of success for seed plants.

(v) What do you know about diploid parthenogenesis?

Ans Development of an egg without fertilization is called as parthenogenesis. In aphids, the egg-producing cells of the female undergo a modified form of meiosis involving total non-disjunction of chromosomes. They retain diploid number of chromosomes. Egg develops into young females. It is called diploid parthenogenesis.

(vi) What is oestrous cycle?

Ans Oestrous cycle is a reproductive cycle found in all female mammals except human being. In this cycle, the estrogen production prepares the uterus for conception partly and also follicle develops ova. At this stage, female needs a physical stimulus of mating for ovulation. She exhibits the desire for mating or is said to be on "heat".

(vii) Define gene and allele.

Ans **Gene**

Gene is the basic unit of biological information. Genes are actually parts of DNA comprising its base sequences.

Allele:

An allele is a member of the gene pair.

(viii) Differentiate between autosomes and sex-chromosomes.

Ans

Autosomes

Any eukaryotic chromosome other than sex-chromosome is called autosome. Autosomes are present in the same number and kind in both males and females of the species e.g., human has 44 autosomes in 22 pairs.

Sex-chromosomes

Usually, X and Y Chromosomes are called sex-chromosomes because they have genes for determination of sex e.g., humans have one pair of sex chromosomes.

(ix) What is a multifactorial trait? Give an example.

Ans The inheritance of a trait which is controlled by several genes and is affected by environmental factors as well is called multi-factorial inheritance.

Blood pressure is example of multi-factorial trait. There is a correlation between systolic and diastolic blood pressure of parents and their children. Blood pressure is also influenced by environmental factor such as diet, stress and tension.

(x) Define the term ecosystem.

Ans A biological community together with the associated abiotic environment is called ecosystem. The ecosystem is a major unit of ecology.

(xi) What is the difference between ectoparasite and endoparasite?

Ans **Ectoparasite**

The parasite that lives outside the body of the host, e.g., fungi causing dandruff in hair are ectoparasites.

Endoparasite

Endoparasite lives inside the body of the host e.g., tapeworm lives in intestine of man.

(xii) Define grazing. What is the result of overgrazing?

Ans Many animals like rabbits, goats, sheep, cows, buffaloes and horses feed on grasses. This mode of feeding is called grazing and these animals are called grazers.

If too many animals are kept on pasture, they eat the grasses completely. Overgrazing may lead to formation of desert.

4. Write short answers to any SIX (6) questions: (12)

(i) What is the difference between primary and secondary growth?

Ans **Primary growth**

In primary growth, primary tissue is added by the apical meristems in the plants.

Secondary growth

In secondary growth, secondary tissue is added by the intercalary or vascular cambium leading to increase in thickness of stems in plants.

(ii) What is discoidal cleavage?

Ans In bird's egg, the process of cleavage or cell division is confined to small disc of protoplasm lying on the surface of the yolk at the animal pole. This type of cleavage is termed as discoidal cleavage e.g., in chick embryo development.

(iii) What is mitotic apparatus?

Ans The specialized microtubule structure including aster and spindle is called mitotic apparatus. It is designed to attach and capture chromosomes, aligning them and finally separating them so that equal distribution of chromosomes is ensured.

(iv) Differentiate between necrosis and apoptosis.

Ans

Necrosis

Internal programme of events and sequence of morphological changes by which cell commits suicide is collectively called as apoptosis.

Apoptosis

The cell death due to tissue damage is called necrosis, during which the typical cell swells and bursts.

(v) Define Hardy-Weinberg theorem.

Ans

It states that the frequencies of alleles and genotypes in a population's gene pool remain constant over the generations unless acted upon by agents other than sexual recombination.

(vi) What are analogous organs? Give an example.

Ans

Analogous organs are functionally alike but structurally different e.g., wings of bat, birds and insects are examples of analogous organs.

(vii) What is the difference between template strand and sense strand?

Ans

Template strand

Only one of the two strands of DNA are transcribed. This strand is called template strand.

Sense strand

The opposite strand is called coding or sense strand.

(viii) What is point mutation? Give an example.

Ans

These are mutational changes which affect the message itself, producing alterations in the sequence of DNA nucleotide. If alterations involve only one or a few base pairs in the coding sequence, they are called point mutations e.g., sickle cell anaemia, phenylketonuria.

(ix) What is membrane invagination hypothesis?

Ans

According to this hypothesis, the prokaryotic cell membrane invaginated (folded inward) to enclose copies of its genetic material. This invagination resulted in the formation of several double-membrane-bound entities (organelles) in a single cell. These entities could then have evolved into the eukaryotic mitochondrion, nucleus, chloroplast, etc.

SECTION-II

NOTE: Attempt any Three (3) questions.

Q.5.(a) Describe adaptations for thermoregulation in plants? (4)

Ans

Control systems operate in organisms to cope with environmental stresses including temperature extremes.

Adaptations in Plants to Low and High Temperature

High Temperature:

- (i) High temperature denatures the enzymes and damages the metabolism, therefore, high temperature harms or kills the plants.
- (ii) Plants use evaporative cooling to manage with high temperature.
- (iii) Hot and dry weather, however, causes water deficiency resulting in closing of stomata, thus plants suffer in such conditions.
- (iv) Most plants have adapted to survive in heat stress as the plants of temperature regions face the stress of 40°C and above temperature.
- (v) The cells of these plants synthesize large quantities of special proteins called heat-shock proteins. These proteins embrace enzymes and other proteins thus help to prevent denaturation.

Low Temperature:

- (i) In low temperature, the fluidity of the cell membrane is altered, because lipids of the membrane become locked into crystalline structures, which affects the transport of the solutes.
- (ii) The structure of the membrane proteins is also affected.
- (iii) Plants respond to cold stress by increasing proportion of unsaturated fatty acids, which help membrane to maintain structure at low temperature by preventing crystal formation.
- (iv) This adaptation requires time because of this reason rapid chilling to plants is more stressful than gradual drop in air temperature.
- (v) Freezing temperature causes ice crystal formation.
- (vi) The confinement of ice formation around cell wall does not affect as badly and plants survive, however, formation of ice crystals within protoplasm perforates membranes and organelles, hence killing the cells.
- (vii) The plants native to cold region such as oaks, maples, roses and other plants have adapted to bring changes in solutes composition of the cells, which causes cytosol to super cool without ice formation, although ice crystals may form in the cell walls.

(b) Describe nitrogen cycle in detail.

(4)

Ans The Nitrogen Cycle:

The process by which nitrogen of the air is circulated and re-circulated throughout the world of living organisms is known as the *nitrogen cycle*.

Nitrogen makes up to 78 percent of the gases in atmosphere. Since most living things, however, cannot use elemental atmospheric nitrogen to make amino acids and other nitrogen-containing compounds. They are dependent on nitrogen present in soil minerals. So, despite the abundance of nitrogen in the atmosphere, shortage of nitrogen in the soil is often the major limiting factor in plant growth.

Principal Stages of Nitrogen Cycle:

Three principal stages of nitrogen cycle are ammonification, nitrification and assimilation.

1. Ammonification:

Much of the nitrogen found in the soil is the result of the decomposition of organic materials and is in the form of complex organic compounds, such as protein, amino acids, nucleic acids and nucleotides. These nitrogenous compounds are usually rapidly decomposed into simple compounds by soil-dwelling organisms chiefly bacteria and fungi. These micro-organisms use the proteins and amino acids and release excess of ammonia (NH_3) or ammonium ions (NH_4^+). This process is known as *ammonification*.

2. Nitrification:

Several bacteria in soil are able to oxidize ammonia or ammonium ions. This oxidation is known as *nitrification*. Two groups of nitrifying bacteria are responsible for nitrification:

- a) Nitrosomonas--converts ammonia to nitrites.
- b) Nitrobacter--converts nitrites into nitrates.

Although, the plants can utilize ammonium directly, nitrate is the form in which most nitrogen moves from the soil into the roots.

3. Assimilation:

Once nitrate is within the plant cell, it is reduced back to ammonium. This assimilation process requires energy. The ammonium ions thus formed are transferred to carbon-containing compounds to produce amino acids and other nitrogenous organic compounds needed by the plant.

Q.6.(a) Describe sliding filament model of muscle contraction. (4)

Ans For Answer see Paper 2019 (Group-I), Q.6.(a).

(b) Describe the process of translation in prokaryotes.(4)

Ans In prokaryotes, translation begins when the initial portion of an mRNA molecule binds to rRNA molecule in a ribosome. The mRNA lies on the ribosome in such a way that only one of its codons is exposed at the polypeptide site at any time.

A tRNA molecule possessing the complementary three nucleotide sequence or anticodon, binds to the exposed codon on the mRNA. As the ribosome moves along the messenger RNA, successive codons on the mRNA are exposed and the series of tRNA molecules bind one after another to the exposed codons. Each of these tRNA molecules carries an attached amino acid, which is added to the end of the growing polypeptide chain.

Particular tRNA molecules become attached to specific amino acids through the action of activating enzymes called aminoacyl-tRNA synthetase, one of which exists for each of the 20 common amino acids.

In prokaryotes, polypeptide synthesis begins with the formation of initiation complex. First a tRNA molecule carrying a chemically modified methionine (called N-formyl methionine) binds to the small ribosomal subunit. Proteins called initiation factor position the tRNA on the ribosomal surface at the P site (peptidyl site) where peptide bonds will form. Nearby two other sites will form. A site (for aminoacyl site), where successive amino acid bearing tRNAs will bind and the E site (for exit site) where empty tRNAs will exit the ribosome. This initiation complex, guided by another initiation factor, binds to AUG on the mRNA.

After the initiation complex has formed, the large ribosome subunit binds tRNA molecule with the appropriate anticodon appears, proteins called elongation factors assist in binding it to the exposed mRNA codon at the A site. The two amino acids which now lie adjacent to each other undergo a chemical reaction, catalyzed by the large ribosomal subunit, which releases the initial methionine from its tRNA and attaches it instead by a peptide bond to the second amino acid.

The ribosome now moves (translocates) three more nucleotides along the mRNA molecule in the 5' → 3' direction,

guided by other elongation factors. This movement translocates the initial tRNA to the E site and ejects it from the ribosome, repositions the growing polypeptide chain (at this point containing two amino acids) to the P site, and exposes the next codon on the mRNA at the A site. When a tRNA molecule recognizing that codon appears, it binds to the codon at the A site, placing its amino acid adjacent to the growing chain. The chain then transfers to the new amino acid, and the entire process is repeated.

Elongation continues in this fashion until a chain-terminating non-sense codon is exposed. Non-sense codons do not bind to tRNA, but they are recognized by release factors, proteins that release the newly made polypeptide from the ribosomes.

Q.7.(a) Differentiate between instinctive and learning behaviour. (4)

Ans

Instinctive behaviour	Learning behaviour
1. This is the type of behaviour that depends on the heredity material, which the animal inherits. The animal may be born with the right responses built in the nervous system as part of its inherited structure.	1 This type of behaviour depends on the environmental influence, but the ability to modify the behaviour depends on the heredity material.
2. Experience has no obvious influence on this type of behaviour.	2. Experience has an obvious influence on this type of behaviour.
3. This type of behaviour depends on the selection operating during the history of species, so that it helps in the adaptability of the organism in the environment.	3. This type of behaviour depends on the selection operating during the history of the individual (during one's life-time) so as to help the organism in its adaptability in the given environment.
4. Instinct can equip an animal with a series of responses. This is advantageous for animals with short life-spans, and with little or	4. Learning can equip an animal with a set of adaptive responses to its environment. This is advantageous for those animals, which have long

no parental care.	life-spans and have parental care, so that they can modify the behaviour by previous experiences.
5. This type of behaviour evolves slowly in the species.	5. This type of behaviour evolves during the life cycle- of the individual but the ability of learning depends on the genetic basis of the individual.
6. For example: (i) Honey bees inherit the ability to form wing muscles and wings for flight. They inherit the tendency to fly towards flowers to seek nectar and pollen. (ii) Behaviour of digger wasp is instinctive; but it does learn certain things during its brief life, such as locality of each of its nests, where it has to return after hunting.	6. For example: (i) Conditioned reflex type I, in case of dogs where dogs learn to salivate on ringing of bell alone. (ii) Trial and error learning in case of cat, when it learns to press the lever to open the door of the cage. (iii) Crawling snail on a sheet of glass, learns that tapping has no harmful effect and ceases to respond after few early responses.

(b) Write a note on ozone layer depletion.

(4)

Ans Ozone Layer Depletion:

Due to air pollution, we are facing the ozone layer depletion.

A layer of atmosphere extending 10-50 km above earth, which filters most of UV radiation and protects us from these harmful rays of the sun is known as ozone layer, as it contains ozone. In pure form, ozone is bluish, explosive and highly poisonous gas. Ozone (O_3) molecule is made up of three oxygen atoms bounded together.

Ozone depletion:

The latest studies of ozone layer reveals that ozone is rapidly depleting.

The decline in thickness of the ozone layer is caused by increasing level of chlorofluorocarbons (CFCs), which contains chlorine, fluorine and carbon.

These gases are produced from the air-conditioners in our homes, offices, vehicles, and operating refrigerators. As CFCs rise to the atmosphere, ultraviolet rays cause chlorine to release. The chlorine released destroys the ozone molecule in ozone layer.

As the ozone layer become thinner, more ultraviolet rays from the sun are able to reach earth. The level of ozone in the ozone layer over the Antarctica has fallen drastically and has led to a hole. The ozone layer has also been found to decrease over arctic regions.

If more ultraviolet rays reach the earth's surface, they will affect all life on earth by increasing temperature. They cause skin cancers and cataracts in human. They can also affect crops, plants, trees and even marine plankton and distort weather patterns.

Q.8.(a) Write a note on vernalisation. (4)

Ans Vernalisation:

Biennials and perennial plants are stimulated to flower by exposure to low temperature. This is called vernalisation. The low temperature stimulus is received by the shoot apex of a mature stem or embryo of the seed but not by the leaves as in photoperiodism.

For some plants, vernalisation is an absolute requirement or in some cases it simply assists in inducing flowering. The duration of low temperature (chilling) treatment required varies from four days to three months. Temperature around 4°C is found to be very effective. It stimulates the production of "vernalin" hormone which induces vernalisation. It is now believed that vernalin is nothing special but actually is gibberellin.

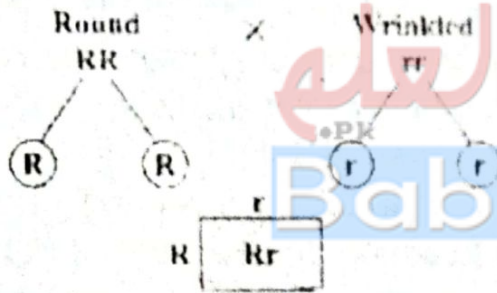
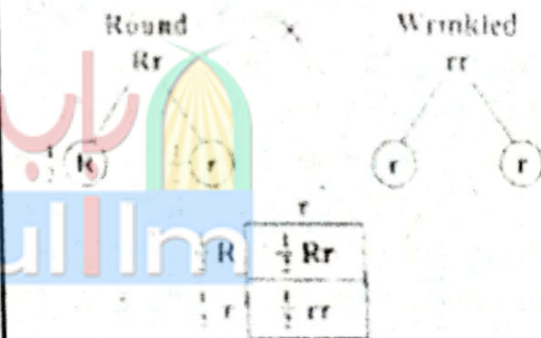
Photoperiodism and vernalisation serve to synchronise the reproductive behaviour of plants with their environment, ensuring reproduction at favourable times of year. They also ensure that members of the same species flower at the same time, encouraging cross pollination for genetic variability.

(b) Define and explain test cross. (4)

Ans Mendel devised a cross called test cross, which is used to test the genotype of an individual showing a dominant phenotype. It is a mating in which an individual showing a

dominant phenotype is crossed with an individual showing its recessive phenotype. This cross finds out the homozygous or heterozygous nature of the genotype.

A phenotypically round seed could be homozygous (RR) or heterozygous (Rr).

Case-I	Case-II
<p>If the seed is homozygous round (RR) it will grow into a pea plant that forms all gametes with only "R" allele. Wrinkled seed plant is always homozygous recessive. It will form all gametes with "r" allele. Fertilization will result in 100% round seed progeny.</p>  <p>Result: All round seed progeny. The tested phenotypically dominant individual is homozygous.</p>	<p>If the seed is heterozygous round (Rr), it will grow into a plant that forms half the gametes with "R" and half with "r" allele. Wrinkled seed plant will form only "r" type of gametes. Fertilization will result into 50% round and 50% wrinkled seed progeny. Even a simple wrinkled seed in the progeny is a convincing proof for heterozygous nature of the round parent.</p>  <p>Result: ½ round seed, and ½ wrinkled seed progeny. The tested phenotypically dominant individual is heterozygous.</p>

Q.9.(a) Write a comprehensive note on aging. (4)

Ans Aging is an inevitable process and despite all the efforts to inhibit or stop it aging process goes on. It can be defined as negative physiological changes in our body. We identify the adult individual by the following signs of old age, all of them need not be present e.g.,

- (i) Loss of hair pigment.
- (ii) Development of small pigmented areas in the skin of face and arms.
- (iii) Dryness and wrinkling of skin.
- (iv) Loss of agility.
- (v) Increased weight due to fat.
- (vi) Poor vision and forgetfulness.
- (vii) General weakness and decreased body immunity.
- (viii) Degeneration of organs and tissues may also take place e.g., in joints, arthritis arises from the degeneration of cartilage.
- (ix) Degeneration and disappearance of the elastic tissues in the tunica media of the blood vessel results in arteriosclerosis, blood clotting in the coronary arteries.

The exact process of aging is still unknown, but the following points are worth consideration:

1. Mitotic Divisions:

- (i) The cells of tissues have only a finite number of mitotic divisions.
- (ii) Hence the cells may have reached their finite number by the time tissue or organ is fully grown.
- (iii) For example, in the case of nervous system, mental activity and memory deteriorate and there are fewer nerve cells in old age.

2. Changes in Intracellular Substances:

- (i) Changes in intracellular substances take place during aging.
- (ii) For example, collagen acquires increased cross linkages in its protein molecules, while elastic tissues lose their elasticity with the passage of time.
- (iii) There is also hardening and loss of resilience in dense connective tissue and cartilage.

3. Spontaneous Mutation:

- (i) Spontaneous mutation may result in loss of cells and degeneration of tissues.
- (ii) The process of aging can be slowed down by better nutrition and improved living conditions e.g., regular meals; regular exercise, adequate sleeps, abstinence from smoking and maintaining ideal weight can prolong life by an average of 11 years.

(b) Give evidences in support of evolution from comparative embryology and molecular biology. (2,2)

Ans **Comparative Embryology:**

- Closely related organisms go through similar stages in their embryonic development.
- For example, all vertebrate embryos go through a stage in which they have gill pouches on the sides of their throats.
- At embryonic stage of development, similarities between fishes, frogs, snakes, birds, humans and all other vertebrates are much more apparent than differences.
- As development progresses, the various vertebrates diverge more and more, taking on the distinctive characteristics of their classes.
- In fish, for examples, the gill pouches develop into gills, in terrestrial vertebrates, these embryonic structures become modified for other functions, such as the eustachian tubes that connect the middle ear with the throat in humans.
- Comparative embryology can often establish homology among structures, such as gill pouches, that become so altered in later development that their common origin would not be apparent by comparing their fully developed forms.

Molecular Biology:

Evolutionary relationships among species are reflected in their DNA and proteins *i.e.*, in their genes and gene products. If two species have genes and proteins with sequences of monomers that match closely, the sequences must have been copied from a common ancestor.

- For example, a common genetic code brings evidence that all life is related.
- Molecular biology has thus provided strong evidence in support of evolution as the basis for the unity and diversity of life.
- Similarly, taxonomically remote organisms, such as humans and bacteria, have some proteins in common. For example, cytochrome c, a respiratory protein is found in all aerobic species.